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Hence heat is thus changed at a proper distance from the sun. The only adverse criticism we have to offer to this theory follows Professor Kedzie's assumption that the physical basis of universal energy (the ether) is of infinite extent. If this be assumed, his other assumption, that it is *full* of energy, falls to the ground: it could never get full, and energy radiated into it would be truly lost and would never return. If, now, the ether be supposed to have a limiting boundary, Professor Kedzie's theory has a much more certain basis, and, indeed, so far as regards the necessary return of energy, may be fully accepted.

Professor Kedzie advances the theory that sun-spots are dynamic shadows or regions of lower temperature. These are due to the diminution of the quantity of heat generated on the surface of the sun in consequence of the interception and appropriation as gravitation by the planets, of the energy returning to the sun from space.—*C.*

Cope's Origin of the Fittest.[1]—Under the title of "Origin of the Fittest" Professor Cope has collected into book form the various essays which he has published during the last twenty years upon the subject of evolution. During this time Professor Cope has won for himself a leading position among American naturalists, not only as an investigator, but as a thinker. To him is largely due the origin and growth of what is sometimes called the American school of evolution, or Neo-Lamarckism. It is in the essays embodied in the book before us that he has advanced his views and formulated the beliefs of this school.

It is to be regretted that Professor Cope did not see fit to revise these essays and arrange the subject-matter in them into a systematic form. As it is, he has simply reprinted them as they were originally published, with only here and there a note. Some of the chapters are prize essays, some detail results of original investigation, and some were popular lectures. They were written at various times and for all sorts of purposes. There is a deal of repetition and self-quotation. Published in this form, there cannot fail to seem a lack of unity. The reader finds difficulty in discovering any obvious thread to bind the essays into one book, and much of the interest and suggestiveness is lost thereby. Professor Cope promises us in the—let us hope not distant—future a systematic summary of the subject. But this book must be taken for what it is intended,—not as a separate publication or a connected summary, but simply as a collection of the writings of the author.

In the pages of this book may be found the views of the American Neo-Lamarckian school; for although it contains the works of Professor Cope alone, it nevertheless embodies the views of others who have been associated with him in similar work, and it may be taken therefore as expressing more fully than any other publication the substance of Neo-Lamarckism. The teachings of this school as expressed by Professor Cope are briefly as follows:

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[1] The Origin of the Fittest. By E. D. Cope, A.M., Ph.D. 8vo, November, 1886. D. Appleton & Co., New York.

1. Darwin's law of natural selection, or the survival of the fittest, is secondary to the question of the *origin* of the fittest; *i.e.*, variations. According to Darwin, organisms have an inherent tendency to vary, and variations are fortuitous.

2. Professor Cope denies any inherent tendency to vary. There are no tendencies except growth and heredity.

3. Variations are due to

(*a*) Physical and chemical effects of environment.

(*b*) Use and disuse. The effect of use and disuse in the individual is plainly seen, and can be shown in successive generations by palæontological evidence.

(*c*) Consciousness implying effort producing motion. The object of the effort is to satisfy hunger or to give pleasure; the result is variation in the parts used. Sensibility is therefore an important factor in producing variation.

4. The results of physical selection and of use and disuse are constant, those of natural selection more or less fluctuating.

5. Separate groups may vary independently in the same or similar directions owing to the action of similar conditions.

6. These features of variation appear usually in adults. But by acceleration they are inherited in younger stages. Embryology thus becomes crowded and many useless stages are skipped. By retardation variations may be inherited by later stages.

Some of Professor Cope's personal views most worthy of note are these:

Consciousness is a primeval attribute of matter. It was the cause and not the result of organization. All adaptive actions were originally conscious, and this is true even of reflex and automatic actions and of many motions of plants.

Genera are not merely exaggerated species, as Darwin believed, but have had a different sort of origin, so that the same species may be carried from one genus to another.

In regard to the value of these various conclusions there is of course room for great difference of opinion. The most important conclusions are those relating to physical selection and the effect of use and disuse. Professor Cope has here certainly attempted to fill a need distinctly felt by naturalists. The origin of variations and the laws regulating their appearance are at the bottom of all views of descent. Darwin himself has recognized the great difficulty in accounting for the origin of species by the selection of mere chance variations; but he looked upon use and disuse as

PLATE XVI.

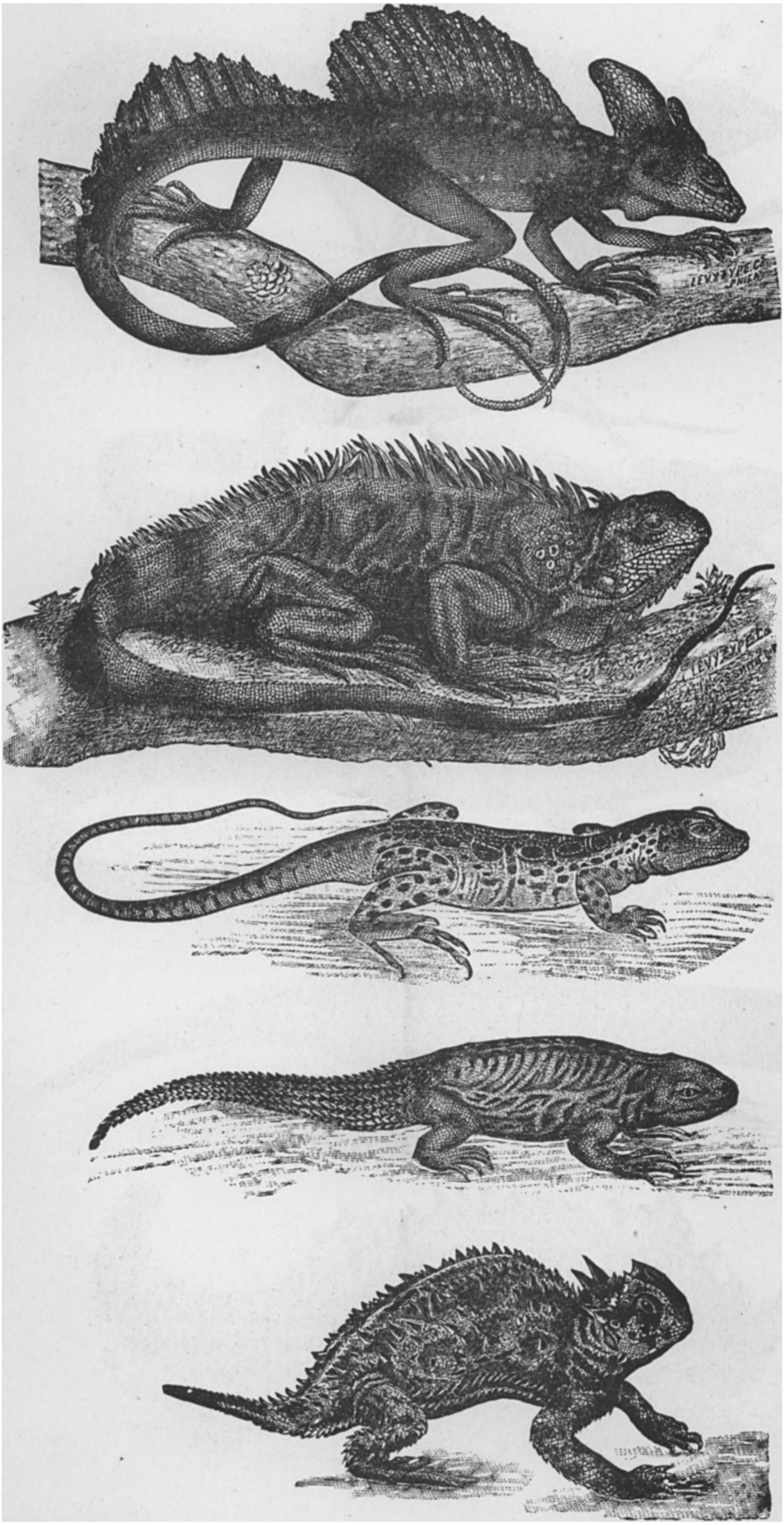
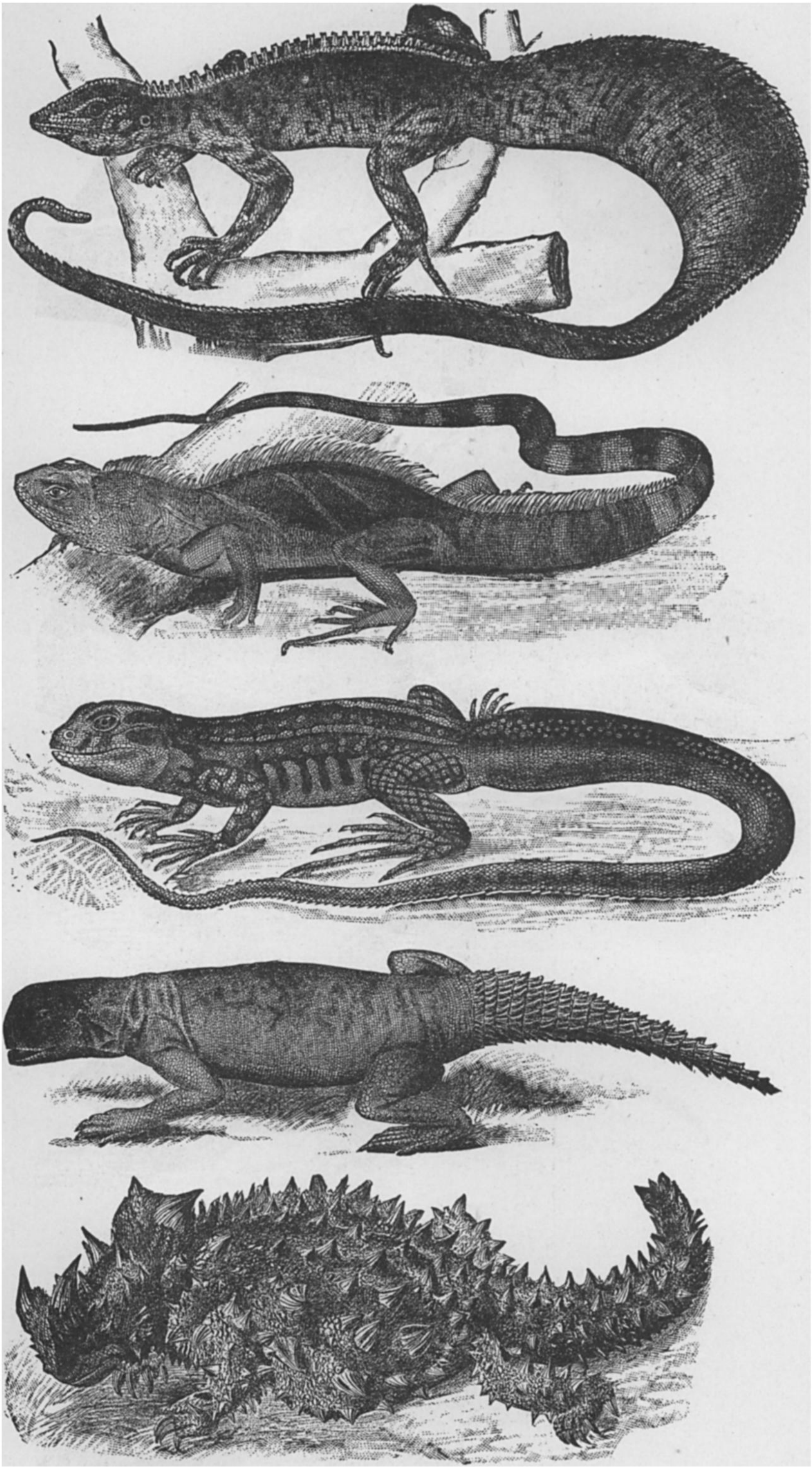


PLATE XVII.



playing only a small part in the matter. Professor Cope and the others who go with him regard use and disuse as the factor of most fundamental importance in producing the variations upon which natural selection can act. The essays of this volume are therefore of great value and full of suggestiveness. They mark a phase in the advance of the evolution problem. They cannot be hurriedly read, but demand careful study on the part of all who wish to comprehend the modern aspects of biological problems. In them every one will perhaps find something with which he will not agree, and many may dispute the general conclusions, but no one can read them without profit. For we must recognize that Professor Cope has attempted to answer a question lying below the law of natural selection. He has attempted to show why variations appear when they are needed and how it is that many animals may vary simultaneously in the same direction. It is hardly time to pass judgment upon his views, but it certainly seems that the observations and suggestions embodied in this book remove many of the difficulties which have been found in the way of the descent theory when viewed from the stand-point of pure Darwinism.

The accompanying plates taken from the book illustrate the remarkable parallelism between genera of different families, called by Professor Cope heterology. Plate XVI. represents five types of the new world Iguanidæ, and Plate XVII. as many of the old world Agamidæ.—*H. W. Conn.*

Geyler and Kinkelin's Pliocene Flora.[1]—Besides the Pliocene deposits of Germany enumerated, 1875, by Sandberger there are two more Pliocene basins,—Hanau-Seligenstadt and Niederrad-Floersheim. The plants of these basins indicate a climate similar to that of the present time and are considered as "Upper Pliocene." About thirty species are described and figured. Of these there are six species identical with recent North American forms, and four extinct species have their nearest relatives among the North American Flora. Six species are recent European forms and seven others are extinct. Seven forms are described as new species; they belong to the genera Pinus, Abies, Fagus, Liquidambar, Rhizomites, and Potamogeton. Several plants, referred to the Oligocene by Ludwig, are Pliocene.

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[1] Die Oberpliocaen Flora aus den Baugruben des Klaerbeckens bei Niederrad und der Schleuse bei Hoechst a. M. 47 pages, 4to, 4 plates. By Th. Geyler u. F. Kinkelin. Abhandl. d. Senckenberg. Naturforsch. Gesellsch., 1887.